```
┌─────────────────────┐
│      Start:          │ ◄── S100
│ static widget cache  │
│  initialization      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│     retrieving       │ ◄── S110
│ widget configuration │
│    file (and DTD)    │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   parsing widget     │ ◄── S120
│ configuration file   │
│      (DTD)           │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   creating widget    │ ◄── S130
│ (pattern / instance) │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   storing widget     │ ◄── S140
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│      End:            │ ◄── S150
│ static widget cache  │
│  initialization      │
└─────────────────────┘
```

Fig. 1a

```
┌─────────────────────┐
│      Start:          │ ◄── S200
│  dynamic screen      │
│  initialization      │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│    retrieving        │ ◄── S210
│ screen configuration │
│   file (and DTD)     │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│   parsing screen     │ ◄── S220
│ configuration file   │
│      (DTD)           │
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│  creating screen ... │ ◄── S230
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│    creating by:      │ ◄── S231
│ *requesting widget   │
│   (clone) from cache*│
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│    creating by:      │ ◄── S232
│ *applying individual*│
│  *settings on widget*│
└─────────────────────┘
          │
          ▼
┌─────────────────────┐
│      End:            │ ◄── S240
│  dynamic screen      │
│  initialization      │
└─────────────────────┘
```
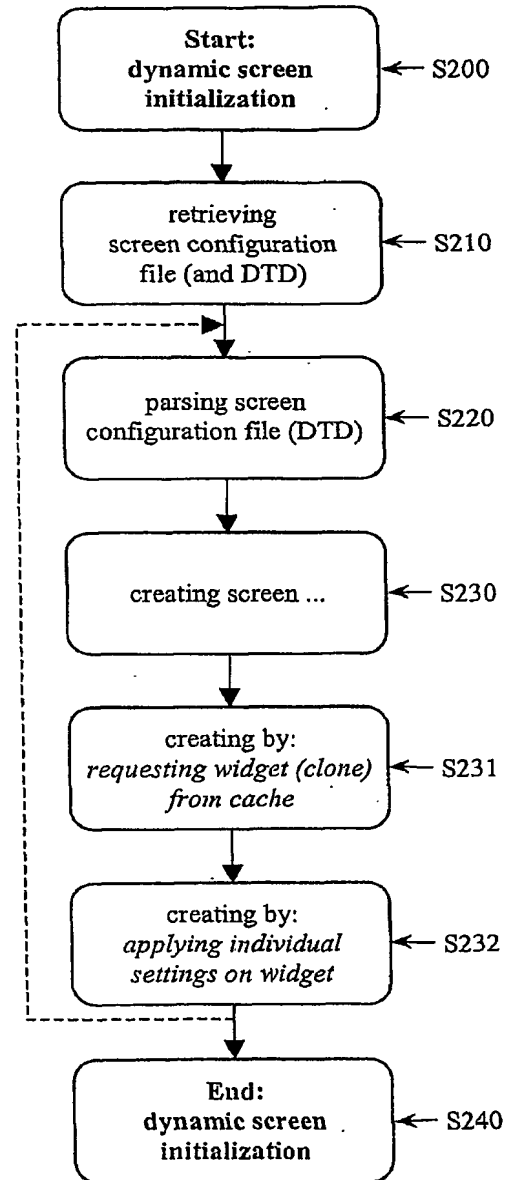
Fig. 1b
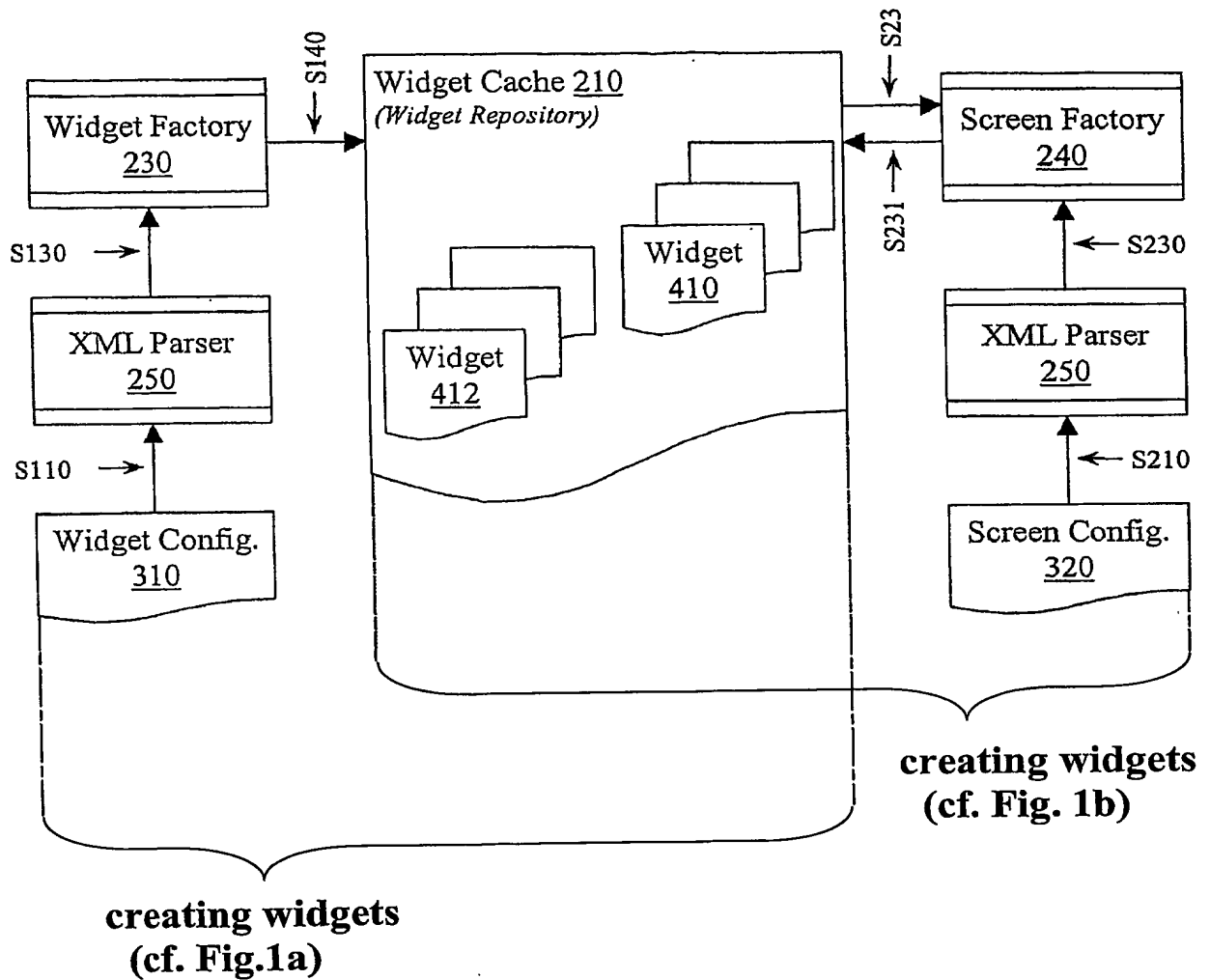
Fig.1c
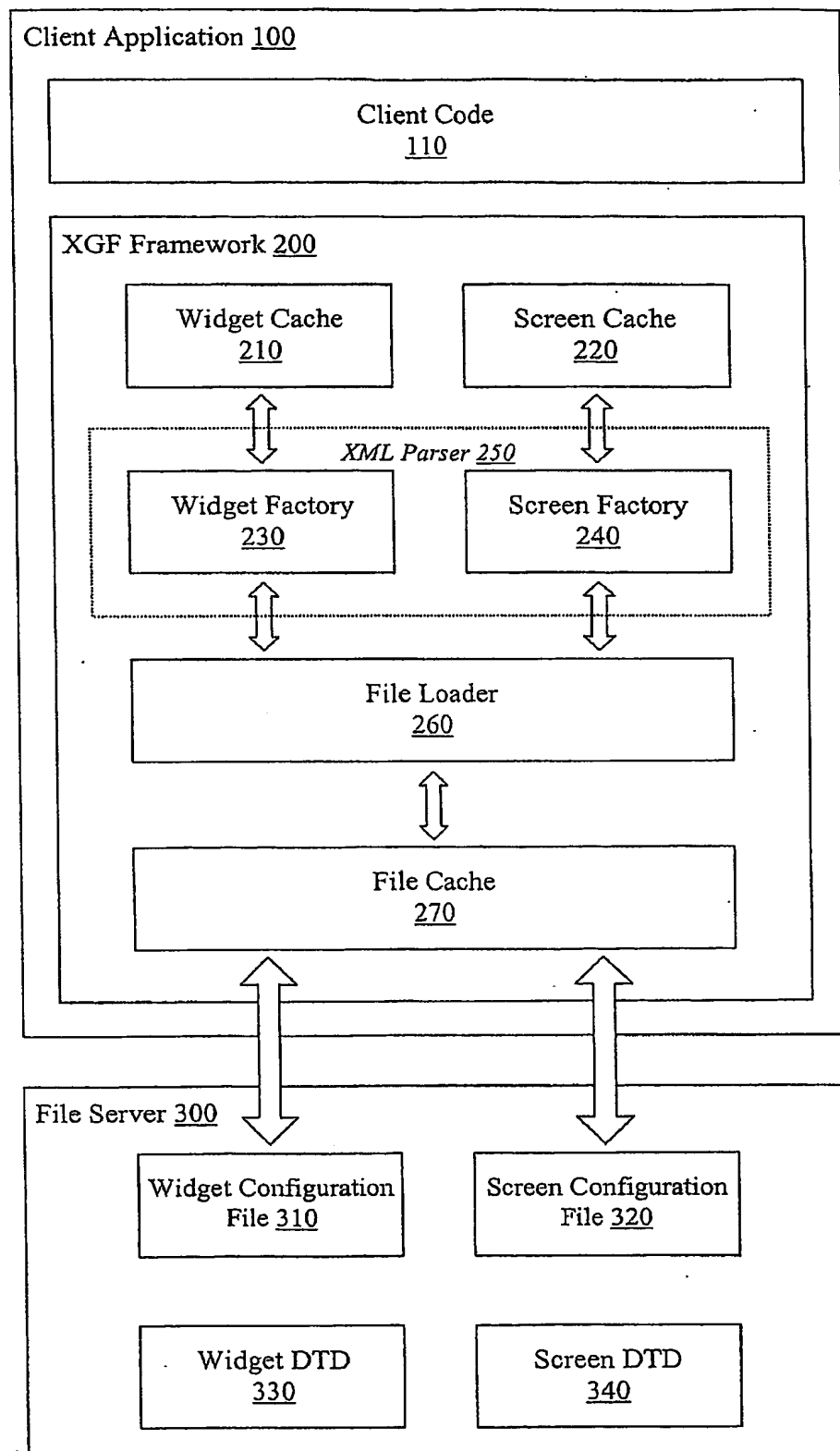
Fig. 2

```
1:    <?xml version="1.0" encoding="ISO-8859-1"?>
2:    <!ELEMENT widgetdefinition (panel | button | listbox | textbox | label | gridlayout | flowlayout | tabpane)*>
3:    <!ATTLIST widgetdefinition
4:          laf (Metal | Motif | Windows | Mac) #REQUIRED
5:    >
6:    <!ELEMENT panel (flowlayout | bevelborder)>
7:    <!ATTLIST panel
8:          class CDATA #REQUIRED
9:          font CDATA #IMPLIED
10:   >
11:   <!ELEMENT label ((bevelborder)?, font?)*>
12:   <!ATTLIST label
13:          class CDATA #REQUIRED
14:          font CDATA #IMPLIED
15:   >
16:   <!ELEMENT button ((bevelborder)?, font?)?>
17:   <!ATTLIST button
18:          class CDATA #REQUIRED
19:          name CDATA #IMPLIED
20:   >
21:   <!ELEMENT textbox ((bevelborder)?, font?)*>
22:   <!ATTLIST textbox
23:          class CDATA #REQUIRED
24:          name CDATA #IMPLIED
25:   >
26:   <!ELEMENT gridlayout EMPTY>
27:   <!ATTLIST gridlayout
28:          class CDATA #REQUIRED
29:   >
30:   <!ELEMENT bevelborder EMPTY>
31:   <!ATTLIST bevelborder
32:          class CDATA #FIXED "javax.swing.border.BevelBorder"
33:          border (LOWERED | RAISED) #REQUIRED
34:   >
35:   <!ELEMENT flowlayout EMPTY>
36:   <!ATTLIST flowlayout
37:          class CDATA #REQUIRED
38:   >
39:   <!ELEMENT font EMPTY>
40:   <!ATTLIST font
41:          name CDATA #REQUIRED
42:          size CDATA #REQUIRED
43:          style (PLAIN | BOLD | ITALIC) #REQUIRED
44:          class CDATA #FIXED "java.awt.Font"
45:   >
46:   <!ELEMENT tabpane (#PCDATA)>
47:   <!ATTLIST tabpane
48:          class CDATA #REQUIRED
49:   >
```

Fig. 3a

```
1:   <?xml version="1.0" encoding="ISO-8859-1"?>
2:   <!DOCTYPE widgetdefinition SYSTEM "WidgetDefinition.dtd">
3:   <widgetdefinition laf="Metal">
4:        <button class="javax.swing.JButton">
5:            <font name="TimesRoman" size="10" style="PLAIN"/>
6:        </button>
7:        <panel class="javax.swing.JPanel">
8:            <bevelborder border="LOWERED"/>
9:        </panel>
10:       <listbox class="javax.swing.JList">
11:           <font name="Arial" size="18" style="PLAIN"/>
12:           <bevelborder border="LOWERED"/>
13:       </listbox>
14:       <textbox class="javax.swing.JTextField">
15:           <font name="Arial" size="10" style="PLAIN"/>
16:           <bevelborder border="LOWERED"/>
17:       </textbox>
18:       <gridlayout class="java.awt.GridLayout"/>
19:       <flowlayout class="java.awt.FlowLayout"/>
20:       <label class="javax.swing.JLabel">
21:           <font name="Arial" size="10" style="BOLD"/>
22:           <bevelborder border="LOWERED"/>
23:       </label>
24:       <tabpane class="javax.swing.JTabbedPane"/>
25:   </widgetdefinition>
```

Fig. 3b

```
1:   <?xml version="1.0" encoding="ISO-8859-1"?>
2:   <!ELEMENT screen (panel)>
3:   <!ATTLIST screen
4:        name CDATA #IMPLIED
5:        class CDATA #REQUIRED
6:   >
7:   <!ELEMENT panel ((gridlayout), (panel | label | textbox | button | listbox | table | tree)+)+>
8:   <!ATTLIST panel
9:        name CDATA #REQUIRED
10:  >
11:  <!ELEMENT label EMPTY>
12:  <!ATTLIST label
13:        name CDATA #REQUIRED
14:        listener CDATA #IMPLIED
15:        layoutmanager CDATA #IMPLIED
16:  >
17:  <!ELEMENT textbox (#PCDATA)>
18:  <!ATTLIST textbox
19:        dataobjectCDATA #REQUIRED
20:        attribute CDATA #REQUIRED
21:        name CDATA #REQUIRED
22:        listener NOTATION (ChangeListener | FocusListener) #IMPLIED
23:        layoutmanager CDATA #IMPLIED
24:  >
25:  <!ELEMENT button EMPTY>
26:  <!ATTLIST button
27:        dataobjectCDATA #IMPLIED
28:        name CDATA #REQUIRED
29:        listener NOTATION (ChangeListener | FocusListener) #REQUIRED
30:        target NOTATION (screen | dataobject) #REQUIRED
31:        layoutmanager CDATA #IMPLIED
32:  >
```

Fig. 4a

```
1:   <?xml version="1.0" encoding="ISO-8859-1"?>
2:   <!DOCTYPE screen SYSTEM "screen.dtd">
3:   <screen name="Sample Screen" class="xgx.screen.AccountView">
4:        <panel name="Accounts">
5:             <gridlayout row="3" col="3"/>
6:             <label name="Account"/>
7:             <textbox name="tb_account" attribute="account_no" dataobject="Accounts" listener="ChangeListener"/>
8:             <button name="Search" dataobject ="Accounts" listener="ChangeListener" target="screen"/>
9:             <label name="Contract"/>
10:            <listbox name="account_no" dataobject ="Accounts" attribute="account_no" listener="FocusListener"/>
11:            <panel name="test">
12:                 <gridlayout row="1" col="2"/>
13:                 <button dataobject="Accounts" name="Ok" target="screen" listener="ChangeListener"/>
14:                 <button dataobject="Accounts" name="Cancel" target="dataobject" listener="FocusListener"/>
15:            </panel>
16:        </panel>
17:   </screen>
```
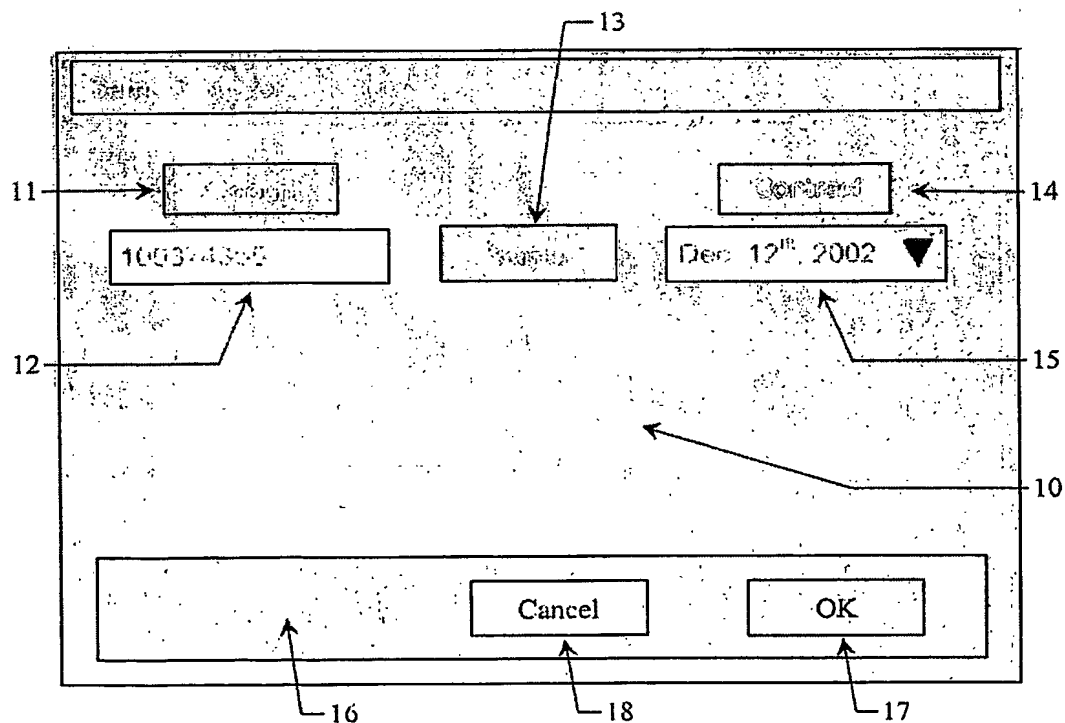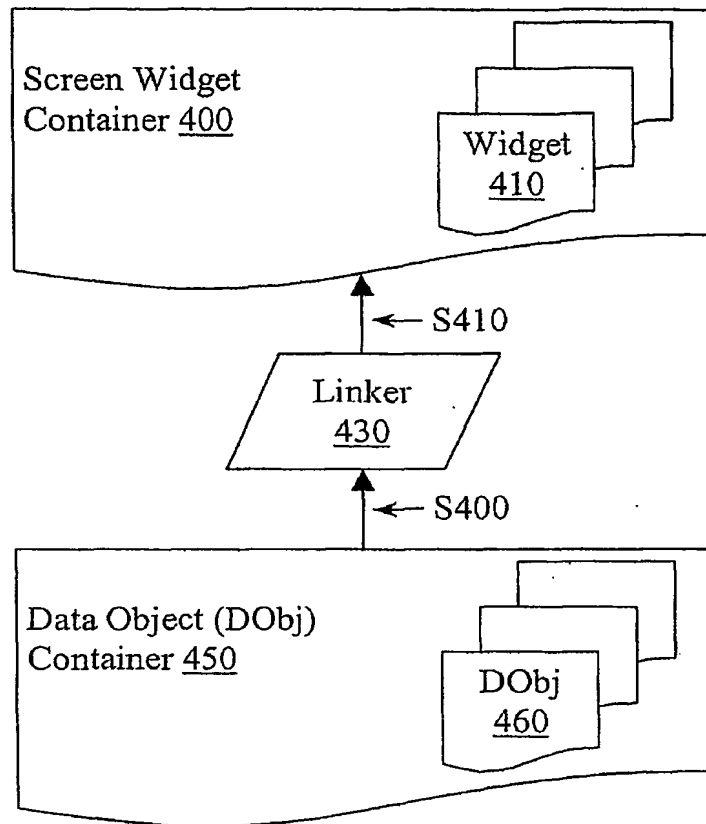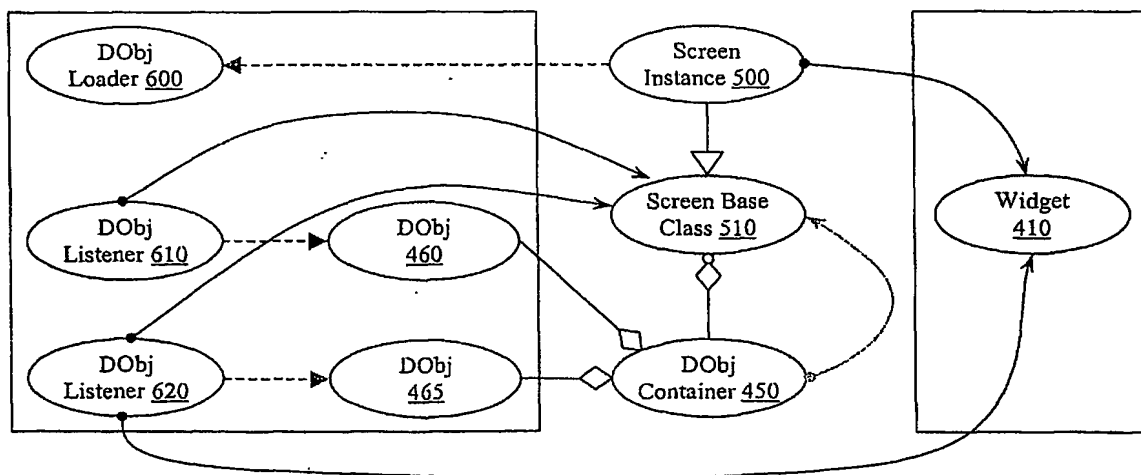
Fig. 4b

Fig. 4c

Fig. 5a

Fig. 5b